MNOSHA Instruction **CPL 2.87**
April 26, 2016
Updated to Accessible form July 25, 2024

SUBJECT: Inspection Procedures for Enforcing the Excavation Standards, 29 CFR 1926, Subpart P.

Purpose:

To establish inspection procedures and provide clarification to ensure uniform enforcement of the Excavation Standards.

Scope:

This instruction applies MNOSHA-wide.

References:

Federal OSHA CPL 2.87, "Inspection Procedures for Enforcing the Excavation Standards, Subpart P, Part 1926", 2/20/90.

Cancellation:

This directive supersedes CPL 2.87 CH-2, dated September 29, 2011.
Background:
Federal OSHA issued revised rules for Subpart P of Part 1926 on October 31, 1989; the standard went into effect at the federal level on January 2, 1990. Minnesota OSHA adopted these standards on February 26, 1990 with an effective date of March 3, 1990. These rules are applicable to all excavations, including trenches.

ACTION:

A. Excavation Protection Programs:

The Excavation Standard provides requirements which allow employers flexibility in developing programs that provide effective protection for employees working in excavations. In addition to the standard itself, the preamble provides further guidance and rationale for changes in the existing standard.

B. Program Compliance:

During all inspections at construction sites, where excavation standards are or will be applicable, OSHIs shall review records which provide documentation of the methodology and background information used to determine whether shoring systems are required and the type of systems used. Compliance with specific requirements of the standard shall also be evaluated.

C. OSHI Responsibilities:

1. Ask the employer for the basis on which the employee excavation protection program related to the standard was developed.

2. Interview a representative cross-section of affected employees to verify the employer's excavation protection program. This shall include an evaluation of the training of affected employees and the effectiveness of the employer's enforcement of its program. [1926.20(b)(1), 1926.21(b)(2) and MN Stat 182.653 subd.8]

3. Evaluate compliance with requirements for periodic inspection of excavations. [1926.651(k)(1)]

4. Identify all persons (competent person, registered professional engineer, etc.) responsible for excavation activities and/or operations.

5. Evaluate compliance with training requirements identified by periodic inspections or changes in equipment and/or procedures. This shall include an evaluation of the effectiveness of the employer's inspection procedures and training program for assessment and correction of situations resulting in near misses and/or injuries or circumstances indicating that modifications are necessary. [1926.20(b)(1) and 1926.21(b)(2) and MN Stat. 182.653 subd.8 (AWAIR)]

6. Identify enforcement problems, including misinterpretations or other difficulties being experienced by employers and apparent efforts by employers to circumvent the standard.

7. Obtain a representative soil sample from which the excavation was created. Bags can be obtained through your supervisor. See Attachment A1 (MNOSHA Addendum)

8. Proposed excavation citations will not be considered immediately abated unless the OSHI observes the excavation in compliance. The citation will not be considered corrected during the inspection even if the employees are removed from the trench excavation and a member of management states they will not return to work until the trench is in compliance. Progress Reports should show methods used to bring the trench excavation into compliance. (Some inspections may require documentation of abatement).

D. Specific Excavation Requirements

1. Scope and Application.

Subpart P applies to all open excavations made in the earth's surface. Excavations are not trenches (if installed form work or other similar obstructions reduce the depth-to-width dimensions for a particular excavation, it may become a trench as defined later in the specific requirements of this policy). [1926.650(a)]

2. Definitions.

The definitions contained in the excavation standard shall be relied upon to interpret and properly apply the standard. In some cases, terms within a definition are themselves defined within the same section. [1926.650(b)]

a. Accepted Engineering Practices.

OSHIs shall verify with the employer which aspects of the employee protection system have been designed or approved by a Registered Professional Engineer. The name of the individual or, if a firm, the firm's name, the name of the engineer of record that approved the work for the firm, and the registration number shall be recorded.

Verification shall also be made for all other aspects of the onsite excavation conditions which the employer indicates are under the direct supervision of a Registered Professional Engineer.

Any equipment, shoring devices, shields, or other special aspects of an employer's excavation program in which the compliance investigation reveals the use of a Registered Professional Engineer shall be noted on the MNOSHD 1-B. If such devices, shields, or other special aspects of the employer's program do not comply with the requirements of the standard, appropriate citations shall be issued.

The OSHI shall determine that the Registered Professional Engineer of record is in fact working within a discipline applicable to the excavation work; i.e., it would be inappropriate for an electrical engineer to approve shoring design for an excavation.

b. ***Competent Person***. OSHIs shall pay particular attention to the investigation and documentation of data to establish that any person serving as the "competent person" has had training in, and is knowledgeable about, soils analysis, the use of protective systems, and the requirements of this standard; and is capable of identifying existing and predictable hazards in excavation work and has the authority to take prompt measures to abate these hazards (A backhoe operator who would otherwise meet the requirements of the definition is not a competent person if the person lacks the authority to take prompt corrective measures to eliminate existing or potential hazards).

c. ***Hazardous Atmospheres.*** When conditions warrant, the OSHI shall attempt to determine if hazardous or oxygen-deficient atmospheres exist; i.e., dangerous atmospheres which could be encountered in tank removal, sewer repairs, or areas close to a landfill where it is not uncommon to encounter hydrogen sulfide (H2S).

d. ***Tabulated Data***. The OSHI shall examine and ensure that all tabulated data for protective systems are approved by a Registered Professional Engineer. Use of the tabulated data in the appendices to this standard does not require approval by a Registered Professional Engineer. Tabulated data must be on the jobsite.

3. General Requirements.

a. ***Surface Encumbrances.*** The standard requires that all surface encumbrances that are located so as to create a hazard to employees shall have been removed or supported, as necessary, to safeguard employees. The requirement applies to all employees at the construction worksite [1926.651(a)]; i.e., trees, rocks, sidewalks, pavement, curb, stops.

b. ***Underground Installations.*** The estimated location of utility installations, such as sewer, telephone, fuel, electric, and water lines, or any other underground installation that may reasonably be expected to be encountered during excavation work shall have been determined prior to opening an excavation.

1. The employer shall contact utility companies or owners, advise them of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation.

   When utility companies or owners cannot respond to a request to locate underground utility installations within 48 hours or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and detection equipment or other acceptable means of locating utility installations are used.

While the excavation is open, the employer must ensure that underground installations are protected, supported, or removed to safeguard employees from hazards [1926.651(b)(2) and (3)].

2. The OSHI shall ascertain whether the employer has contacted the appropriate utility companies to establish the location of underground installations that may be encountered. Employers must contact "Gopher State One Call" prior to the start of excavation work. [1926.651(b)(2)]

3. When excavation operations approach the estimated location of the underground installation, the exact location of the underground installation shall be determined by means that are safe to employees. [1926.651(b)(3)]

4. The OSHI shall determine that underground installations have been protected, supported, or removed as necessary to protect employees. [1926.651(b)(4)]

c. ***Access and Egress***. The standard requires that employees working within an excavation greater than 4' in depth are provided with a means of egress to and from an excavation. A means of egress can be in the form of a stairway, ladder or ramp and must be provided every 25'.

The sloped end of a trench (e.g. an earth ramp) may be considered a safe means of egress only if employees are able to walk the ramp in an upright manner when entering or exiting the trench. The OSHI shall consider such factors as the degree of the slope, depth of the excavation, soil and environmental conditions, and the presence of any obstructions in determining whether or not the earth ramp can be used for safe egress. An employer may not use knotted rope lines to assist employees using sloped areas as access to trenches. Lifting equipment is not considered to be an "other means of egress"; i.e., employees riding in a backhoe bucket to either enter or exit trench excavations is not an "other safe means of egress" under this standard. [1926.651(c)(2)]

d. ***Exposure to Earth Moving Equipment.*** Minnesota Rules 5207.1000(4) requires that employees working on the ground who are exposed to mobile earth-moving equipment shall be provided with and required to wear high visibility warning vests or other high visibility garments meeting the Class II definition as specified by ANSI/ISEA Standard 107-2004. [5207.1000(4)]

e. ***Exposure to Falling Loads.*** The standard prohibits employees being under loads handled by lifting or digging equipment and this includes both excavated materials and slung loads (i.e., pipes). [1926.651(e)]

f. ***Warning Systems for Mobile Equipment***. The OSHI shall ensure that an adequate warning system has been provided for mobile equipment operating adjacent to or without a clear view of the edge of excavations. (This requirement does not apply to equipment used to push soil back into the excavation for backfilling.) [1926.651(f)]

g. ***Hazardous Atmospheres.*** In addition to the requirements of Subparts D and E of Part 1926, and in conjunction with Minnesota Rules 5207.0300, "Confined Spaces", the following requirements must be met to prevent exposure to harmful levels of atmospheric contaminants and to ensure acceptable atmospheric conditions:

1. Air quality tests shall be taken before employees enter excavations more than four (4) feet in depth when a hazardous atmosphere exists or could be expected to exist.

2. Tests shall be conducted as often as necessary to ensure the quality and quantity of the atmosphere. This includes checks for flammable gases and oxygen (O2) deficiency.

3. When hazardous atmospheres exist or may reasonably be expected to exist, emergency rescue equipment must be on the worksite and readily accessible to employees. [1926.651(g)(2)(i)]

4. Daily inspections must be conducted by a competent person. Evidence of the lack of such inspections may include indication of failure of protective systems or employees exposed to hazardous atmospheres. [1926.651(k)(1)]

h. ***Protection from Hazards Associated with Water Accumulation.*** The standard requires that employees shall not work in excavations in which water has accumulated or where water is accumulating, unless adequate precautions are being taken to protect employees.

Adequate precautions may be in the form of water removal systems, support of shielding systems or use of a full body harness and lifeline. [1926.651(h)]

i. ***Stability of Adjacent Structures***. The standard requires that where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, adequate precautions shall be taken to ensure protection of employees.

Adequate precautions include shoring, bracing, underpinning and other support systems. Excavations made below footings is not permitted unless an adequate support system is in place, the excavation is in stable rock, or a registered professional engineer determines that excavation will not pose a hazard or the structure will be unaffected. [1926.651(i)]

j. ***Protection of Employees from Loose Rock or Soil***. Protection shall be provided to employees working within an excavation from materials that could fall, roll or slough into the excavation. Excavated material (spoil pile) and equipment that pose the hazard shall be kept at least 2' from the edge of the excavation. [1926.651(j)]

k. ***Inspections.*** A daily inspection of the excavation, adjacent areas and protective system are required to be completed by a competent person. Inspections shall be completed prior to the start of work and as needed throughout the work shift to identify situations that could result in cave-ins, failure of

protective systems, hazardous atmospheres and other hazardous conditions. See definition of Competent Person in definitions section. [1926.651(k)(1)].

1. Who designate OSHIs should ask the following questions to determine if employee/person is a competent person:
   a. Who designated you to be a competent person?
   b. Do you have the authority to correct hazards?
   c. Do you have the authority to stop work?
   d. What type of training have you had to become a competent person?
   e. Do you know what type of soil you are working with?
   f. How did you identify what type of soil you are working with?
   g. What type of test (visual, plasticity, pentrometer) did you use to classify the soil?
   h. How do you know what type of protective system to use for each soil type?

2. OSHIs must describe why the person is a competent person or why they are not a competent person. There must be a determining factor documented in the case file why the individual is or is not a competent person.

3. If an inspection of the excavation was not completed by a competent person or there was no competent person cite1926.651(k)(1).

4. Protective Systems

a. When the employer has elected to protect employees by sloping, 1926.652(b)(1) requires that the slope cannot be steeper than 1.5:1 "unless the employer uses one of the other options". Once OSHA shows that no support system was used and that the sides of the excavation were steeper than 1.5:1, the employer has the burden of showing its compliance with one of the other sloping options. However, the OSHI shall document all relevant facts to evaluate the hazard to obtain information which may be necessary for rebuttal of the employer's case.

   1. Regardless of the protective system utilized by the employer (support systems, sloping and benching systems, shield systems, and other systems that provide necessary protection), if employees are exposed to potential cave-in hazards because of an inadequate protective system OSHIs shall propose a citation for 1926.652(a)(1).

   2. Appendix B, Figure B-1 Slope Configurations indicates that all excavations 20’ or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18” above the top of the vertical side. OSHI’s shall propose a citation for 1926.652(a)(1) for this violation.

b. If the OSHI observes a protective system that appears inadequate or in danger of failure, the employer's representative or competent person shall be notified immediately so as to remove any employees in the excavation until such danger of failure has been abated. [1926.652(a)(2)]

c. In evaluating the design of sloping and benching systems, the OSHI shall refer to the decision chart in Figure 2 of Appendix F, 'Selection and Protective Systems." [1926.652(b)(1) through (b)(4)]

   To evaluate the design of support systems, shield systems and other protective systems, refer to the decision chart in Figure 3 of Appendix F. [1926.652(c)(1) through (c)(4)]

d. The OSHI shall examine appropriate structural members of any protective system for damage or defects. [1926.652(d)(1)]

e. Observation by OSHIs of excavations beneath the protective system requires confirmation that the support system was designed to resist forces calculated for the full depth of the trench. Maximum depth below protective system is two feet. [1926.652(e)(2)(i) and (g)(2)]

f. 1926 Subpart P Appendix F – Selection of Protective Systems - excavations exceeding 20’ in depth must be designed by a registered professional engineer (RPE) in accordance with 1926.652(b) and (c).

   For excavations exceeding 20’ in depth where the protective system was not designed by a Registered Professional Engineer, OSHIs shall propose a citation for 1926.652(b)(4)(i). This will not be grouped with 1926.652(a)(1). If the protective system was designed by a Registered Professional Engineer, but was not constructed according to the design, OSHIs shall propose a citation for 1926.652(a)(1).

5. Appendices in the Standard.

a. The following compliance guidelines apply whenever OSHIs encounter excavations where employers have elected to provide protective systems using the appendices in this standard. OSHIs shall provide documentation, including soil tests where applicable, to support or reject the employer's decisions on protective systems. See Attachment A (MNOSHA Addendum), MNOSHA Excavation Worksheet.

b. When the employer elects to use sloping option 2 or support option 1, the soils classification procedures are mandatory. Employer guesses or other shortcuts taken in classifying soils do not meet the intent of the standard.

   Citations shall be issued where one or more provisions of Appendix A (see item 6 below) have been violated even if the degree of sloping turns out to be appropriate. Example: A backhoe operator

slopes an excavation at what turns out to be an appropriate slope, but the operator is not a competent person within the meaning of the standard, and the determination was not based on both one visual and one manual test. 1926.652(a)(1) will be cited, but the gravity of the violation will be reduced. The competent person must have the authority to stop work. [1926.652(a)(1)]

c. If an employer is disputing the classification of soil after a citation is contested, a soil sample analysis can be obtained using procedures contained in Attachment A1 (MNOSHA Addendum) "Soil Sampling and Soil Preparation", with a detailed explanation of the soil type. This would include compressive strength, cohesion, moisture content and plasticity.

6. Appendix A to Subpart P - Soil Classification.

This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions and on the structure and compaction of earth deposits. Appendix A contains further definition directly related to soil classification.

a. The classification of soil and rock deposits shall be made based on the results of at least one visual and one manual test.

   1. Such analysis shall be conducted by a competent person using the tests described in paragraph (d) of Appendix A.

   2. The specific soil tests referenced in Appendix A are given as examples for an employer to use in making a soil classification. However, other recognized methods of soil classification and testing, such as those adopted by the American Society of Testing Materials (ASTM), are acceptable for purposes of compliance with the standard.

   3. The competent person conducting the soil classification may not base a classification by "feeling" the strength or composition of the soil through the use of heavy equipment.

      This method is not an acceptable "other recognized method of soil classification and testing" contemplated by Appendix A, (c)(2). This method is too indirect to properly classify the qualitative as well as quantitative properties of soil. For example, an employer may not classify the soil as Type A solely because the backhoe experienced difficulty digging the excavation.

b. Each soil and rock deposit shall have been classified by a competent person as either stable rock, Type A, Type B, or Type C in accordance with definitions in paragraph (b) of Appendix A.

c. In a layered system, the system shall have been classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

d. If, after classifying soil and rock deposits, the properties, factors, or conditions affecting its classification change in any manner, such as after a rainstorm, such changes shall have been evaluated by the competent person on site. The soil and rock deposits shall have been reclassified as necessary to reflect any changed circumstances.

e. MNOSHA does not recognize frozen soil as an effective means of protective system and the soil shall be classified based on its unconfined compressive strength.

Attachment A1 (MNOSHA Addendum) – Soil Sampling and Soil Preparation Procedures. This attachment describes a method to collect soil samples from an excavation to be sent to the Federal OSHA lab in Salt Lake City, Utah.

7. Appendix B to Subpart P- Sloping and Benching.

Under section (c)(3)(ii) of Appendix B, whenever surcharge loads from stored material or equipment, operating equipment, or traffic are to be present, the competent person's determination of the degree to which the actual slope must be reduced below the maximum allowable slope shall have been based on the requirements set forth in (c)(3)(ii). The requirement to slope back in accordance with (c)(3)(ii) shall be triggered in situations where the surcharge loads cause signs of distress.

8. Appendix C to Subpart P - Tables.

OSHIs should note that Tables C-1.1-1.3 are actual size measurements based on mixed oak or equivalent with a bending strength not less than 850 psi. On the other hand, Tables C-2.1, 2.2 and 2.3 are nominal (S4S-Surface 4 Sides) measurements based on Douglas fir or equivalent with a bending strength not less than 1500 psi.

9. Appendix D to Subpart P - Aluminum Hydraulic Shoring for Trenches.

This appendix contains criteria that can be used when aluminum hydraulic shoring is to be used as a method of protection in trenches not exceeding 20 feet in depth, in the absence of manufacturer's tabulated data. The appendix is provided for those situations where manufacturer's data, permitted under paragraph 1926.652(c)(2), has been lost or is otherwise not available. When referenced, Appendix D must be used in conjunction with Appendix A, "Soil Classification."

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For the MNOSHA Management Team

Distribution: OSHA Compliance and WSC Director

Attachments: - Attachment A – MNOSHA Excavation Worksheet
Attachment A1 (MNOSHA addendum) - Soil Sampling and Soil Preparation Procedures
Attachment B – Federal OSHA Trench Calculation Tool Instructions (Madison, WI office)
Attachment B1 – hyperlink to Excel document Trench Calculation Tool (TCT)
Attachment B2 – hyperlink to Excel document TCT Formula Sheet

NOTICE: Minnesota OSHA Directives are used exclusively by MNOSHA personnel to assist in the administration of the OSHA program and in the proper interpretation and application of occupational safety and health statutes, regulations, and standards. They are not legally binding declarations and they are subject to revision or deletion at any time without notice.

Attachment A1 (MNOSHA Addendum)

Soil Sampling and Soil Preparation

Proper Technique for Collection of Soil Samples

It is important that the soil sample be representative of the area you want to study (confirm with employer that your sample is a representative sample for the site). Follow directions below to ensure that the test results represent the entire sampling area, which is typically the spoil pile.

1. Select an area for sampling (representative of where employees are working).
2. Collect soil from several different points in the area.
3. Scoop away ground cover before sampling.
4. Be sure to take soil from the surface and from several inches below the surface.
5. Do not include large rocks or plant pieces in your sample.
6. Perform manual and visual tests. See below
7. Collect samples: ideal sample size is: 1 liter or ¼ full gallon plastic bag
8. When you have enough soil for your test; mix well.
9. Label the container to identify the sampling area. Include collection date and description of the site.
10. Store the soil sample in a locked drawer in your control/possession.

Source: Bostonteachnet.org

Acceptable visual and manual tests

Visual tests: While on site

Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

- Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.
- Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
- Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spill off a vertical side, the soil could be fissured. Small spills are evidence of moving ground and are indications of potentially hazardous situations.

- Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.
- Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.
- Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.
- Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

Manual tests: While on site

Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

Plasticity (Thread)

Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two-inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.

Dry strength

If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps, which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

Thumb penetration

The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. [Based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488 - "Standard Recommended Practice for Description of Soils (Visual - Manual Procedure)."]

- *Type A soils* with an unconfined compressive strength of 1.5 tsf or greater can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Examples of

cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam.

- *Type B soils* with an unconfined compressive strength of less than 1.5 tsf but greater than 0.5 tsf can be penetrated by the thumb. soils including: Examples angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.

- *Type C soils* with an unconfined compressive strength of 0.5 tsf or less can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. Granular soils including gravel, sand, and loamy sand. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.

Unconfined compressive strength with a pocket penetrometer

1. Select a fresh undisturbed clod of soil from the spoil bank. DO NOT ENTER THE TRENCH FOR A SAMPLE. Be sure to take multiple samples. The sample must be saturated (voids filled with water).
2. Cut a smooth face on the clod.
3. Slide the maximum strength indicator ring, slip ring on the calibrated tube, down next to the handle.
4. Grasp the knurled handle of the pocket penetrometer being careful not to interfere with the roll pin, which slides in the slots machined in the handle.
5. Push the penetrometer shaft (pencil sized end) ¼ inch into the soil up to the groove machined on the shaft (1/4 inch from the end). Use a steady and firm push; the action should take several seconds.
6. Read the indicated unconfined compressive strength off the calibrated tube on the side of the slip ring closest to the handle of the device. The smallest division on the tube is 0.25 tons per square foot (tsf), which permits the user to estimate the unconfined compressive strength to 0.05 tsf.
7. Note: the sample must be saturated and intact. Saturated does not mean that water must be oozing or seeping from the soil, only that the soil voids are filled with water.

Lab Analysis

1. Shipping & Packaging the soil

The method for packaging the soil samples for shipment to the Salt Lake Technical Center (SLTC) will include the following:

a) The soil sample should approximately fill a 1 gallon heavy-duty zip-lock type bag.
b) Samples will be double bagged and placed in heavy-duty plastic bags that will not tear and secured and sealed airtight with tape.

c) Each soil sample will be sealed for identification with an official Form 21 seal (Foil Security Tape) containing a field number, sampling date and the sampler's name.
d) Pack the bagged soil in a heavy duty box so that it will not break during shipment.

2. MOOSE:

a) Go to – Desktop drop down – select "Health Sample"
b) Select – OSHA-91A/B/S
c) Leave blank – Inspection ID
d) Write Down – Reporting ID (and sample #)
e) Fill In – Sample Survey Date

3. Air Sample Report – OSHA 91S:

a. Print Form – OSHA 91S
   i. Located at OSHA-ENF/Work Groups/Health/Lab/Sample Forms
b. Fill In:
   i. Reporting ID (Collected from MOOSE)
   ii. Inspection #
   iii. Sampling Number (Collected from MOOSE)
   iv. Establishment Name
   v. Person Performing Sampling (Signature)
   vi. Print Last Name
   vii. OSHI ID#
   viii. Sample Date
   ix. Shipping Date
   x. Weather Conditions (i.e. dry, rainy, sunny, etc.)
   xi. Job Description, Operation (i.e. excavation)
   xii. Analyze samples for: Substance Code (S777 Soil)
   xiii. Contract # (A99152) at top of form (note: this number changes each State Fiscal Year)
   xiv. Note what you want on the same line as the substance code (i.e. "Determination of Soil type")
   xv. Attach business card for questions
c. Place soil sample and copy of OSH 91S in cardboard box. Do not put the form in contact with the soil (if it is wet it will destroy the form).

4. Bring sample to Administrative Support to mail to

Physical Measurements Team
Industrial Hygiene Chemistry Division
OSHA Salt Lake Technical Center
8660 South Sandy Parkway
Sandy, UT 84070

NOTE: A shipper will be used that will provide a tracking number, such as UPS.

The following contains is the MN OSHA Excavation worksheet that lists factors, standards, and data to be considered when inspecting and excavation.

OSHI #	OPT. REPORT #	DATE	TIME

MNOSHA EXCAVATION WORKSHEET **Attachment A – MNOSHA Addendum**

EMPLOYER:
SITE ADDRESS:
GOPHER STATE ONE-CALL [(651) 454-0002/1-800-252-1166] NOTIFIED/LOCATION MARKINGS: _____ YES _____ NO
IF NO, CALLED OFFICE OF PIPELINE SAFETY [(651) 296-9636]: DATE: _____ TIME: _____

	EXCAVATIONS -- 4 FOOT TO 5 FOOT DEEP (Check if present on site)		**EXCAVATIONS – 5 FOOT DEEP AND OVER** (Check if present on site)
	Competent person		Competent person
	Egress		Soil analysis (visual and manual)
	Inspection		Sloping required (If no testing is done, the width of the excavation will be the bottom width plus three times the depth. This will equal a 1½:1 ratio.)
	Confined space (O_2 testing)		

SOILS – REFERENCE 1926.652, APPENDIX A (Check if present on site)					
	Type C (1½:1)		**Type B (1:1)**		**Type A (¾:1)***
	Fissures		Previously disturbed Type A or B		Undisturbed
	Porous soil		Fissured Type A		Type of soil (circle one): Rocky Clay Silty clay Sandy clay Clay loam
	Vibration		Subject to vibration Type A		
	Water (Rain, etc.)		Type A rock not stable		
	Submerged soil		Type of soil (circle one): Silt Silty loam Sandy loam Crushed rock		
	Previously disturbed soil				
	Type of soil (circle one): Gravel Sand Loamy sand				Compressive strength ≥ 1.5 tsf
					Test Method(s) Used by Investigator
	Compressive strength ≤ 0.5 tsf		Compressive strength > 0.5 tsf, but Compressive strength < 1.5 tsf		Pocket Pentrometer
					Manual Method

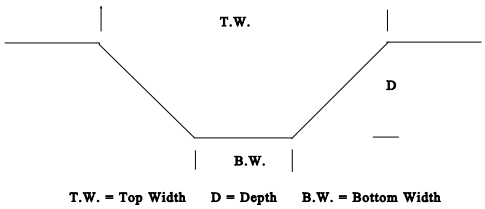
* (½:1) Allowed if 12 ft. in depth or less, and open 24 hours or less.
Tsf = tons per square foot

ADDITIONAL FACTORS (Check if present on site)			
	Utilities identified, located, and supported [1926.651(b)]		Spoil pile two feet back [1926.651(j)(2)]

	Egress from excavation [1926.651©(2)]		Competent person inspections [1926.651(k)(1)]
	Warning vests [5207.1000(4)]		Fall protection [1926.651(l)(1)]
	Exposure to falling loads [1926.651(d)]		Use of protective system [1926.652(a)]
	Water accumulation [1926.651(h)]		Use of guardrails, fences, barricades, or covers [1926.501(b)(7)]
	Stability of adjacent structures (undercutting) [1926.651(i)(1)]		

PROTECTIVE SYSTEMS						
	SLOPING AND BENCHING SYSTEMS					
	Option (1) – Allowable configurations and slopes [1926.652(b)(1)]					
	Option (2) – Determination of slopes and configurations using Appendices A and B [1926.652(b)(2)]					
	Option (3) – Designs using other tabulated data [1926.652(b)(3)]					
		Parameters		Limits		On site
	Registered Professional Engineer/Name: License #					
	Option (4) – Design by a registered professional engineer [1926.652(b)(4)] – Mandatory in excavations 20 feet or more in depth					
		Magnitude of slopes		Safe Configurations		On site
	Registered Professional Engineer/Name: License #					
	SUPPORT SYSTEMS, SHIELD SYSTEMS, & OTHER PROTECTIVE SYSTEMS					
	Option (1) – Design using Appendices A, C and D [1926.652(c)(1)]					
	Option (2) -- Designs using manufacturer's tabulated data [1926.652(c)(2)]					
	Option (3) -- Designs using other tabulated data [1926.652(c(3)]					
		Parameters		Limits		On site
	Registered Professional Engineer/Name: License #					
	Option (4) -- Design by a registered professional engineer [1926.652(c)(4)]					
	Plan indicating sizes, types, & configurations					
	Registered Professional Engineer/Name: License #					

Specify dimensions of excavation on drawing below. Use the space provide for calculations or to add any additional
The space provided for calculations or to add any additional information.



Competent Person Determination - Suggested Questions:

a) Who designated you to be the CP? b) Do you have the authority to correct hazards? c) Do you have the authority to stop the work? d) What type of training have you had to be the CP? e) Do you know what type of soil you are working with? f) How did you identify

Description/Comments:

Attachment B

The following is the Trench calculation tool, called the TCT. It is a tool that can be used to determine measurements in an excavation such as depth, slope, and width based on know measurements taken in the excavation.

TCT Introduction

The TCT (Trench Calculation Tool) was developed to assist OSHIs in documenting an excavation inspection. The technique used in this program to measure an excavation is not the only way to calculate/measure an excavation. This program is fast, effective, and most important accurate way to measure an excavation. This program doesn't represent every type of excavation an OSHI will come across in the field, but it does represent a general idea of the excavation being inspected.

Material an OSHI must read or understand before using the TCT:

1. CFR 1926.650-652.
2. Appendix A-F of Subpart P.
3. Definition and direction sheet to the TCT. (These two pages)
4. The formula sheet to the TCT.
5. Entering data into excel.

Definitions/terms used in this program:

Amount Out of Compliance: The distance in feet, that the top width or horizontal is from being in-compliance with Subpart P.
Angle: The slope of an excavation wall measured in degrees from horizontal.
Bottom Width: The distance across the bottom of the excavation from Side 1 to Side 2.
Depth: The vertical distance of the excavation from the bottom to the top.
Horizontal: The horizontal width of an excavation face.
Length: The distance in feet of an excavation wall from the toe to the top edge at the angle.
Required Horizontal: The horizontal width of an excavation face that the standard would require based on the soil type and the configuration of the excavation.
Required Width: The distance across the top of the excavation from Side 1 to Side 2 that the standard would require based on the soil type and the configuration of the excavation.
Top Width: The distance across the top of the excavation from Side 1 to Side 2.

How to use the TCT

The two main steps for using the TCT:

1. Look at the four different types of excavations on the program and select the one that best represents the excavation you inspected.

2. Enter the data/information in the yellow boxes.

Note: The yellow boxes are the only place you can enter data.  Click on the left side of the box to enter data.

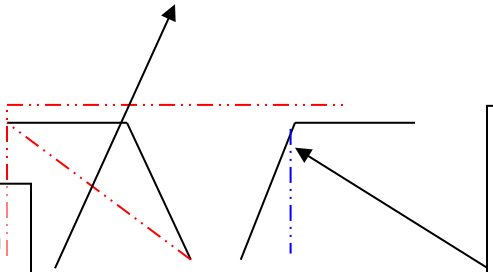
What does the numbers, charts, and drawing represent?

The charts below are the calculations box for the top width and horizontal widths of an excavation. A***, A, B, and C are different types of soil. Soil A*** has an angle of 63 degrees to be in-compliance, soil A has an angle of 53 degrees to be in-compliance, soil B has an angle of 45 degrees to be in-compliance, and soil C has an angle of 34 degrees to in-compliance.

TOP WIDTH CALCULATION	A ***	A	B	C
Required Width	0.0	0.0	0.0	0.0
Amount Out Of Compliance	0.0	0.0	0.0	0.0

Note: A*** is allowed for excavations that are open for 24 hours or less and are 12 feet or less in depth.

HORIZONTAL CALCULATION	A ***	A	B	C
Required Horizontal	0.0	0.0	0.0	0.0
Amount Out Of Compliance	0.0	0.0	0.0	0.0



The numbers that are in the calculation boxes are red because the red lines on the drawings represent them.

The words depth, horizontal, bottom width, and numbers are calculated by the TCT and are the color blue. The blue colored lines on the drawing represents these calculations.

After the calculations are completed, if a negative number (example: -2.1) appears in the ***Amount Out Of Compliance*** calculation (both horizontal and top width boxes) that means the sloping and or dimensions for that excavation are incompliance for that particular soil type. Example:

HORIZONTAL CALCULATION	A ***	A	B	C
Required Horizontal	3.1	4.6	6.1	9.2
Amount Out Of Compliance	-2.1	-0.5	1.0	4.1

In this example, the excavation is in-compliance if the soil is classified as type A*** or A. However, if the soil is B or C the excavation is not in-compliance.

Note: Each side has its own horizontal calculation box, so the data is specific to its own side.

Attachment B1

Trench Calculation Tool (excel document, click hyperlink)

Attachment B2

TCT Formula Sheet (excel document, click hyperlink)